REMARKS

Claims 21-24 and 33-45 are pending for prosecution in the present application. Non-elected method claims 15-17 are withdrawn and remain in the application for possibility of rejoinder. To this end, Applicants respectfully request rejoinder of method claims 15-17 should a claim to the structure of a balloon catheter used in the method be allowed. Based on the arguments provided herein, Applicants respectfully submit that the claims of the present application distinguish over the prior art of record and are in condition for allowance.

I. Claim Rejection - 35 USC §102(b)

In the FINAL Office Action dated April 7, 2009, claims 21-24 are rejected under 35 USC §102(b) as being anticipated by U.S. Patent No. 6,776,771 B2 issued to van Moorlegem et al.

Van Moorlegem et al. disclose a dilation catheter that is used to widen a restricted blood flow passage. More specifically, van Moorlegem et al. disclose a dilation catheter for use in a procedure known as Percutaneous Transluminal Coronary Angioplasty (PTCA) for treating a patient having a stenosis (narrowing or constriction of the diameter of a bodily passage). During a PTCA procedure, the dilation catheter is used to increase the lumen by radial expansion of a balloon.

More specifically, the dilation catheter disclosed by van Moorlegem et al. has a series of segmented chambers spaced apart by "flexibly compliant links". For example, see chambers (5) and links (7) in FIGs. 2 and 3. The links (7) provide gaps between chambers (5) and function as flexible hinges so that "as the balloon is routed through a body lumen, curvature in the lumen is mimicked by the balloon, as it is able to flexibly conform to the shape of the lumen path by

preferential bending at the flexibility links" (see Abstract). As best stated on column 4, lines 27-34, the flexibly compliant links "effect improved flexibility of the balloon by breaking up the rigidity of an otherwise single elongate chamber." Accordingly, van Moorlegem et al. teach away from the use of a single elongate balloon chamber and clearly require gaps to promote flexibility.

Another important teaching provided by van Moorlegem et al. with respect to the above referenced catheter is that:

> "If the inflated balloon obstructs blood for too long (typically for more than a few seconds), **permanent damage to downstream organs can occur** due to ischemia, which is the cessation of blood flow through the lumen. Accordingly, it is often desirable to **keep the patient's blood flowing through the lumen while the balloon is in the inflated state**. This is preferable to cycling the balloon between an inflated and deflated state, as such action can place additional stress on an already compromised lumen wall."

Turning to the FINAL Office Action, the Examiner interprets van Moorlegem et al. to provide the following disclosures:

> "... van Moorlegem discloses **inflatable balloons 5/9** ... The **outer balloon 9** when inflated forms an elongate, continuous cylindrical tube having an outer diameter that is substantially constant along a full length of the tube and is capable of abutting the walls of a vessel ... to occlude blood flow. ... The device is **capable of occluding the aortic space or vena cavae**".

Applicants respectfully disagree with these interpretations of van Moorlegem et al. and respectfully request reconsideration. The reference numeral "9" in van Moorlegem et al. identifies a "sleeve", not a balloon. Also, the catheter is designed to dilate a lumen, not occlude blood flow. Further, the dilation catheter is not capable or intended to occlude the aorta or vena cavae and such use in a warm (i.e. normal body temperature) patient under pulsed blood flow

conditions would be lethal, even if the balloon is inflated for only a few seconds as noted by the van Moorlegem patent.

Further, the catheter of claim 21 of the present application is not only required to occlude bulk flow through the main vessel (i.e., aorta or vena cavae), but also through side branch vessels branching therefrom. No new matter was added. For example, see the last six lines of Paragraph No. 0094 and the last six lines of Paragraph No. 0099 of the present application, as filed. Accordingly, unlike the catheter of van Moorlegem et al., the catheter of the present invention relies on the homogenous distribution of force throughout the full length of the main vessel (i.e., aorta or vena cavae) to prevent collateral and cross-flow into and out of side branch vessels.

Applicants respectfully submit that it is well established that a claim of a patent application is anticipated under 35 USC §102 only if each and every element is found described in a single prior art reference. The identical invention must be shown in as complete detail as contained in the claim. The elements identified by the reference must be arranged as required by the claim.

Claim 21 of the present application requires "a balloon catheter for use in **infusion of macromolecular complexes** into the venous microvasculature of **a hypothermic patient**". The balloon catheter is required to have "an inflatable balloon ... when inflated, ... forming an elongate, continuous, cylindrical tube having an outer diameter that is substantially constant along a full length of said tube and that is sufficient to abut the walls of a main vessel in which it has been inserted to occlude flow therethrough and flow from side branch vessels into and out of the main vessel."

In the FINAL Office Action, element "9" of van Moorlegem et al. is interpreted as being an "inflatable balloon". Applicants submit that this is an error. Column 3, lines 33-34, of van Moorlegem et al. refers to the use of a "flexible liner or sleeve" used to cover a flexible balloon catheter. Also see column 8, lines 25-26, which states that "the outer surface of the balloon chambers 5 can be surrounded with a flexible sleeve 9". Also, see column 8, lines 47-50, which discloses that the sleeve 9 can have "ample porosity" for purposes of carrying and delivering a drug. Accordingly, sleeve (9) is not a balloon, and it is not subject to inflation. Rather, it is a flexible porous sleeve.

Still further, van Moorlegem et al. clearly disclose a flexible balloon catheter (see Title of patent) and teach away from a rigid balloon, when inflated, having a single elongate chamber (i.e., one without flexible compliant links/gaps (7)). See column 4, lines 32-34.

Finally, the van Moorlegem et al. patent relates to a dilation catheter designed for use in a warm patient under conditions of pulsed blood flow. Van Moorlegem et al. clearly state that if its catheter obstructs blood flow for "more than a few seconds" permanent damage will occur to downstream organs. See column 1, lines 56-65. Thus, the catheter is clearly not designed to occlude flow through the aorta or vena cavae and prevent collateral or cross-flow between side branch vessels as this would be rapidly lethal to a warm patient under conditions of pulsed blood flow.

For all the above reasons, Applicants respectfully submit that independent claim 21 and dependent claims 22-24 are not anticipated by the van Moorlegem et al. patent. Van Moorlegem et al. fail to disclose an inflatable balloon that, when inflated, forms an elongate, continuous, cylindrical tube having an outer diameter that is substantially constant along a full length of said

tube"; rather, van Moorlegem et al. disclose a non-inflatable porous sleeve (9) and a balloon having segments (5) separated by gaps (7) that provide flexibility when the balloon segments (5) are inflated. Accordingly, Applicants respectfully request reconsideration and removal of the anticipation rejection of claims 21-24.

II. Claim Rejection - 35 USC §103(a)

A. In the FINAL Office Action dated April 7, 2009, claims 34-40 are rejected under 35 USC §103(a) as being obvious over U.S. Patent No. 5,728,066 issued to Daneshvar.

Daneshvar discloses a balloon catheter for use in a warm patient (i.e. at normal body temperature) under pulsed blood flow conditions. For example, Daneshvar provides a "resistance means" to be "created in front of the flow of the blood in the lumen of a vessel so that the speed of the blood in the vessel will decrease and this prevents the quick washout of the injected materials" (see Abstract). More specifically, Daneshvar is directed to the injection of "contrast media" that "quickly washes out by the rapid flow of the blood" (see column 10, lines 35-38).

Claim 34 of the present application is directed to an internal occlusion balloon catheter for occluding fluid flow through the aorta of a hypothermic patient and requires an inflatable and radially expandable balloon that, in an inflated condition within the aorta, forms an elongate, continuous, substantially-cylindrical tube along its full length continuously from a location adjacent a bottom of the patient's abdominal aorta through the patient's aortic arch and into the patient's ascending aorta thereby substantially filling and occluding blow flow within the patient's entire aorta. Thus, the homogenous distribution of force through the full length of the

aorta occludes bulk flow through the aorta and prevents collateral cross-flow into and out of side branch vessels of the aorta.

In the Office Action, the Examiner acknowledges the small size of the balloon of Daneshvar and acknowledges that Daneshvar fails to disclose a balloon that extends the length of the entire aorta. Of course, this also means that Daneshvar fails to disclose a balloon that is structured to prevent collateral or cross-flow into side branch vessels of the aorta. However, the Examiner concludes that these deficiencies of the cited reference can simply be overlooked because "it would have been an obvious matter of design choice to a person of ordinary skill in the art to modify the balloon of Daneshvar" and because "Applicant has not disclosed that such a limitation provides an unexpected advantage, or is used for a particular purpose or solves a stated problem."

Applicants respectfully submit it would **not** have been an obvious matter of design choice to a person of ordinary skill in the art to modify the balloon of Daneshvar such that the balloon would be of a size to extend continuously from a location adjacent a bottom of the patient's abdominal aorta through the patient's aortic arch and into the patient's ascending aorta thereby substantially filling and occluding flow within the patient's entire aorta as well as collateral cross-flow into and out of branch vessels extending from the aorta. The simple explanation for this is that one of ordinary skill in the art would be aware that such a modification would be lethal when used for the purposes of Daneshvar. Also, the purpose of the catheter of Daneshvar is simply to provide a "resistance means" to be "created in front of the flow of the blood in the lumen of a vessel so that the speed of the blood in the vessel will decrease and this prevents the quick washout of the injected materials". Daneshvar does not teach or require the homogenous

distribution of force through the full length of the vessel to occlude bulk flow through main vessel and to prevent cross-flow through branch vessels.

It is well established that when a §103 rejection is based upon a modification of a reference that destroys the intent, purpose or function of the invention disclosed in the reference, such a proposed modification is not proper and a *prima facie* case of obviousness cannot be properly made. In re Gordon, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984).

As discussed above, the intent, purpose and function of the catheter invention of Daneshvar is to provide "resistance means" to be "created in front of the flow of the blood in the lumen of a vessel so that the speed of the blood in the vessel will decrease and this prevents the quick washout of the injected materials." However, if the balloon of Daneshvar is enlarged/lengthened to extend continuously from a location adjacent a bottom of the patient's abdominal aorta through the patient's aortic arch and into the patient's ascending aorta thereby substantially filling and occluding blow flow within the patient's entire aorta for purpose of preventing quick washout of injected material due to the speed of blood flow in a warm patient, one of ordinary skill in the art would be well aware that the deployment of such a balloon for the stated purpose in a warm patient under conditions of pulsed blood flow would result in the almost instantaneous fatality of the patient.

Accordingly, one of ordinary skill in the art would avoid modifying the balloon of Daneshvar in a manner that would be lethal to the patient. Thus, it would not be an obvious matter of design choice to provide the catheter of Daneshvar with the balloon as required by claim 34 of the present application.

Further, Applicants respectfully submit that the catheter required by claim 34 of the present application is used for a particular purpose and solves a stated problem. The present invention relates to a catheter for occluding flow through a patient's aorta (claim 34) as well as the branches/vessels communicating with the aorta during a procedure when a macromolecular complex is being infused/delivered into a venous microstructure of a hypothermic patient, such as via retrograde perfusion under high pressure. The purpose of the catheter is to facilitate delivery of desired complexes to target host cells (such as targeted delivery to the heart, skeletal, or respiratory muscles) while minimizing side effects (such as by eliminating exposure of other non-targeted areas of the body to the complex, such as the liver or lung). As stated in Paragraph No. 0077 of the present application, as filed, this involves isolating cardiac circulation from the remainder of the patient's circulatory system and cooling the heart to about 15 to 18°C. By way of example, FIG. 7 of the present application, as filed, discloses an arrangement for cardiac isolation.

The catheter required by claim 34 facilitates compartmentalization of the circulation in the central and peripheral vascular systems. See Paragraph No. 0081 of the present application, as filed. The central circulation (i.e., vessels directly supplying the thoracic and abdominal viscera) must be separated from the peripheral circulation (i.e., vessels supplying the skeletal muscles). When in the process of delivering a macromolecular complex to the heart, high venous pressure is applied and the inflated balloons transiently restrict flow of fluids between the peripheral and central circulations. Since the central vascular system includes vessels supplying the thoracic and abdominal viscera, vector transport to the abdominal viscera is minimized by

restricting flow through the aorta and vena cavae, as they interconnect vessels supplying the thoracic and abdominal viscera.

Accordingly, the catheter of claim 34 of the present invention is designed to be deployed solely when the patient is under total circulatory arrest, when the patient's heart is cooled to about 15 to 18°C, when circulation rate is depressed, and when cardiac circulation is isolated from the remainder of the patient's circulatory system. If the catheter is applied when the patient is warm under conditions of pulsed blood flow (as in Daneshvar), such deployment would be lethal. However, in the present invention, the balloon which extends continuously from a location adjacent a bottom of the patient's abdominal aorta through the patient's aortic arch and into the patient's ascending aorta thereby substantially filling and occluding flow within the patient's entire aorta, occludes fluid flow into and through the aorta and consequently occludes flow into and through branches interconnecting to the aorta. Accordingly, Applicants respectfully submit that the limitations of claim 34 of the present application are used for a particular purpose and solve a stated problem.

For these reasons, Applicants respectfully submit that claim 34 is patentable and is not obvious to one of ordinary skill in the art based on the teachings of Daneshvar.

Turning specifically to claim 35 of the present invention, it requires the balloon to be pre-shaped in a flexible J-shape. Applicants respectfully submit that Daneshvar fails to disclose a balloon which is pre-shaped in a flexible J-shape. In addition, Applicants respectfully submit that it would not have been obvious for one of ordinary skill in the art to provide a J-shaped balloon for all the reasons stated above with respect to claim 34.

Accordingly, Applicants respectfully request reconsideration and removal of the obviousness rejection of claims 34-40.

B. *In the FINAL Office Action dated April 7, 2009, claims 41-45 are rejected under 35 USC §103(a) as being obvious over U.S. Patent No. 5,728,066 issued to Daneshvar in view of U.S. Patent No. 6,776,771 B2 issued to van Moorlegem et al.*

Applicants respectfully submit that the same arguments stated above with respect to the patentability of claims 21-24 and 34-40 over the cited references, individually, also apply to the above referenced rejection when the references are combined. Thus, claims 41-45 are patentable for at least the reasons stated above.

Claims 41-45 provide additional limitations and reasons for patentability. For instance, claim 41 requires a series of separate balloons disposed end-to-end with no gaps therebetween, and claim 42 requires a series of balloons forming an elongate, continuous, substantially-cylindrical tube along its full length, and when positioned within the patient's vena cavae, "one of said balloons being of sufficient length to extend continuously from a location adjacent a lower end of the patient's inferior vena cava to just below a right atrium of the patient's heart and another one of said balloons being of sufficient length to extend through the patient's superior vena cava and occlude the azygous vein but does not extend into the right atrium."

The Examiner admits that Daneshvar fails to disclose a series of separate balloons disposed end-to-end with no gaps therebetween or a series of balloons forming an elongate, continuous, substantially-cylindrical tube along its full length. However, the Examiner states that van Moorlegem et al. disclose a series of balloons and that it would have been obvious to modify

the length of the gaps or "flexibly compliant links" taught by van Moorlegem to zero. Applicants respectfully disagree.

Removing the gaps or links is contrary to the teachings provided by the van Moorlegem et al. patent. For example, van Moorlegem et al. require the links (7) for flexibility, and van Moorlegem et al. teach away from using a rigid single elongate balloon chamber. See column 4, lines 32-34, of the van Moorlegem et al. patent.

It is well established that "teaching away" is the antithesis of the art suggesting that the person of ordinary skill in the art go in the claimed direction. Essentially, "teaching away" is a per se demonstration of lack of obviousness. In re Fine, 873 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

Accordingly, one following the teachings of van Moorlegem et al. would not find modifying the length of the "flexibly compliant links" to zero an obvious modification.

Further, the catheters of both Daneshvar and van Moorlegem et al. are intended for deployment in a warm patient and under conditions of regular pulsed blood flow. Thus, as clearly stated in van Moorlegem et al., "if the inflated balloon obstructs blood flow for too long (typically for more than a few seconds), permanent damage to downstream organs can occur." See column 1, lines 54-60, of the van Moorlegem et al. patent. Compare this with the limitation disclosed by claim 16 of the present application in which the "solution is allowed to dwell for a period of about 5 to 30 minutes." Thus, the balloon of the present invention may be required to be inflated for as much as 30 minutes; in contrast, one is taught by van Moorlegem et al. that blood flow should not be occluded and that permanent damage can occur after a few seconds (and this is not even for a catheter deployed in the aorta or vena cavae).

Thus, one of ordinary skill in the art would be aware that modifying the prior art balloons used in warm patients under normal pulsed blood flow conditions as required to read on the claims of the present application and deploying these balloons in the aorta or vena cavae under such conditions, would be lethal. Thus, such combination and modification would be avoided and would not be an obvious matter of design choice.

Accordingly, Applicants respectfully request reconsideration and removal of the obviousness rejection of claims 41-45 over the cited prior art combination.

III. Conclusion

In view of the above amendments and remarks, Applicants respectfully submit that the rejections stated in the Office Action have been overcome. A favorable action on the merits is therefore requested.

Please charge any deficiency or credit any overpayment for entering this Amendment to our deposit account no. 08-3040.

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